Optical disc recording device

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Inventor: AKINORI SASAKI (JP); NAOSHI KUSUSE (JP)

Applicant: MATSUSHITA ELECTRIC IND CO LTD (JP)

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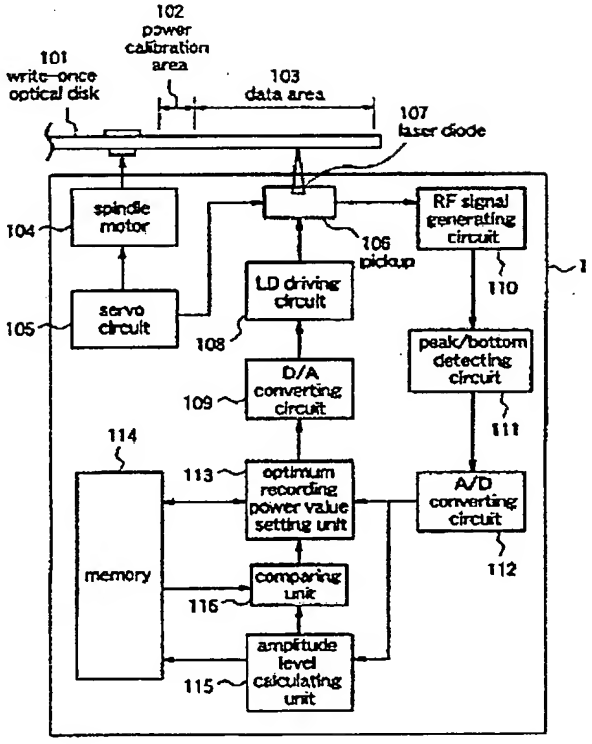
Abstract of CN1287353

The present invention provides one CD recorder, which has less consumption in power calibration area while updating record power properly to prevent degradation in record quality, and its optimal record power setting method. The CD recoder has optimal record power obtained via trial write and the amplitude level Am of replayed RF signal stored in power calibration area. The amplitude level Ar obtained via replaying the trial write area is compared with the stored Am. The stored optimal record power is updated through further trial write if the amplitude level is reduced and is maintained for further use if the amplitude level maintains unchanged.



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Optical disc recording device

Description of corresponding document: **US6339578**

FIELD OF THE INVENTION

[0002] The present invention relates to an optical disk recording apparatus and, more particularly, to an optical disk recording apparatus having a structure for calibrating an optimum recording power when data is recorded on an optical disk.

BACKGROUND OF THE INVENTION

[0003] When data is recorded on a write-once optical disk or the like, in order to obtain stable recording quality, trial writing is performed in a power calibration area on the disk prior to recording, by using plural different recording power values. Then, the area in which the trial writing is performed is reproduced to detect asymmetry of reproduction signals (RF signals), whereby an optimum recording power at the recording is set.

[0004] Usually, trial writings can be performed one hundred times in a power calibration area of a write-once optical disk. Therefore, consumption of the calibration area should be reduced. Conventionally, the consumption of the calibration area has been reduced in the following way.

[0005] When the trial writing is performed once and an optimum recording power is detected, the detected optimum recording power is stored in a memory in an optical disk recording apparatus, together with a disk identification code for identifying the disk. In case of write-once optical disks, information of a disk in process of recording is held in a PMA (program memory area) of the disk, where a disk identification code for identifying each disk can also be recorded.

[0006] When additional recording is performed, the disk identification code is read out from the PMA, while the optimum recording power corresponding to the disk identification code is read out from the memory in the optical disk recording apparatus. Then, additional recording is performed using the readout optimum recording power. Thereby, even if the additional recording is performed after the disk is taken out and then reinserted, or the power is turned off and then turned on, recording can be performed without performing the trial writing again, thereby reducing the consumption of the calibration area.

[0007] As an example, Japanese published patent Hei. 6-349066 discloses a recording laser power setting apparatus which can obtain an optimum recording laser power corresponding to each CD-R disk

[0008] However, the above-mentioned conventional structure in the optical disk recording apparatus, for reading out the optimum recording power corresponding to each disk from the memory therein, to perform additional recording has the following problem. Due to changes with time in a pickup in the optical disk recording apparatus, particularly dirt or dust accumulated in the pickup, the optimum recording power changes. Consequently, if recording is performed using the optimum recording power stored in the memory, the recording quality is deteriorated.

SUMMARY OF THE INVENTION

[0009] The present invention is made to solve the above-mentioned problem, and it is an object of the present invention is to provide an optical disk recording apparatus which can reduce consumption of the power calibration area, as well as cope with changes with time in a pickup.

[0010] Other objects and advantages of the present invention will become apparent from the detailed description and a specific embodiment described is provided only for illustration since various additions and modifications within the spirit and scope of the invention will be apparent to those of skill in the art from the detailed description.

[0011] According to a method of the present invention, the above object can be achieved by checking whether there is a change in an optimum recording power for each disk stored in a memory in an optical disk recording apparatus prior to additional recording on an optical disk, deciding whether desired recording quality can be obtained if the additional recording is performed using the stored optimum recording power, and when it is decided that some problems occur if the stored optimum recording power is used, performing trial writing again to set a new optimum recording power.

[0012] An optical disk recording apparatus according to a first aspect of the present invention comprises: an optimum recording power setting unit for obtaining an optimum recording power of a laser diode when data is recorded on an optical disk, by performing trial writing in a power calibration area on the optical disk; an amplitude level calculating unit for obtaining an amplitude level of a reproduction signal which is obtained by reproducing an area in the power calibration area in which the trial writing is performed with the obtained optimum recording power; a memory for storing the obtained optimum recording power and the amplitude level of the reproduction signal; and a comparing unit for comparing a difference between the amplitude level of the reproduction signal stored in the memory and an amplitude level of a reproduction signal which is obtained by reproducing again the area in which the trial writing is performed with the optimum recording power, to a prescribed value, when additional recording is performed on the optical disk; wherein the optimum recording power setting unit performs trial writing in the power calibration area and sets an optimum recording power to be used in the additional recording when the comparing unit decides that the difference exceeds the prescribed value, and sets the optimum recording power stored in the memory as an optimum recording power to be used in the additional recording when the comparing unit decides that the difference does not exceed the prescribed value. Therefore, even when there are changes with time in the pickup of the optical disk recording apparatus, or particularly, dirt or dust are accumulated in the pickup, the optimum recording power can be set again, thereby preventing the recording quality from being deteriorated.

[0013] A method for setting an optimum recording power in an optical disk recording apparatus according to a second aspect of the present invention comprises the steps of: obtaining an optimum recording power of a laser diode when data is recorded on an optical disk, by performing trial writing in a power calibration area on the optical disk; obtaining an amplitude level of a reproduction signal which is obtained by reproducing an area in the power calibration area in which the trial writing is performed with the obtained optimum recording power; storing the obtained optimum recording power and the amplitude level in the memory; when additional recording is performed in the optical disk, comparing a difference between the amplitude level of the reproduction signal stored in the memory and an amplitude level of a reproduction signal which is obtained by reproducing again the area in which the trial writing is performed with the optimum recording power, to a prescribed value; performing trial writing in the power calibration area and setting an optimum recording power to be used in the additional recording when it is decided that the difference exceeds the prescribed value; and setting the optimum

recording power stored in the memory as an optimum recording power to be used in the additional recording when it is decided that the difference does not exceed the prescribed value. Therefore, effects as those in the first aspect of the present invention are obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a block diagram illustrating an optical disk recording apparatus 1 according to an embodiment of the present invention.

[0015] FIG. 2 is a flowchart for explaining an operation of setting an optimum recording power by the optical disk recording apparatus 1 according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] An embodiment of the present invention will be described with reference to the attached figures. FIG. 1 is a block diagram illustrating an optical disk recording apparatus 1 according to the embodiment of the present invention.

[0017] The optical disk recording apparatus 1 comprises a spindle motor 104 for driving a write-once optical disk 101, a servo circuit 105 for controlling rotation of the spindle motor 104, a pickup 106 for recording data in a data area 103 on the write-once optical disk 101, the pickup 106 mounting a laser diode 107, a LD driving circuit 108 for driving the laser diode 107, a D/A converting circuit 109 for obtaining a driving current for driving the LD driving circuit 108, an RF signal generating circuit 110 for generating a reproduction signal (RF signal) from a signal which is obtained by reading out a power calibration area 102 by the pickup 106, a peak/bottom detecting circuit 111 for detecting a peak level and a bottom level of the RF signal, an A/D converting circuit 112 for A/D-converting the peak level and the bottom level, an optimum recording power setting unit for setting a recording power value of the laser diode 107, a memory for storing the optimum recording power and an amplitude level which is described later, an amplitude level calculating unit 115 for detecting an amplitude level Am of the RF signal, and a comparing unit 116 for comparing an amplitude level Ar detected at additional recording with the amplitude level Am stored in the memory 114.

[0018] The optimum recording power setting unit 113 obtains an optimum recording power of a light emitted from the laser diode 107 when data is recorded on the optical disk 101, by performing trial writing in the power calibration area 102 on the optical disk 101, and records the obtained power value in the memory 114. In performing additional recording, when the comparing unit 116 decides that difference between the amplitude levels Ar and Am exceeds a prescribed value by an operation as described later, the optimum recording power setting unit 113 performs trial writing in the power calibration area 102 and sets an optimum recording power to be used at the additional recording. When the comparing unit 116 decides that the difference between the amplitude levels Ar and Am does not exceed the prescribed value, the optimum recording power setting unit 113 sets the optimum recording power stored in the memory 114 as an optimum recording power to be used at the additional recording in the optical disk 101.

[0019] Next, an operation of the optical disk recording apparatus 1 according to the embodiment will be described with reference to FIG. 2. FIG. 2 is a flowchart for explaining the operation of setting an optimum recording power by the optical disk recording apparatus 1.

[0020] Prior to recording data in the data area 103 on the write-once optical disk 101, an optimum recording power should be obtained.

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[0021] In steps S1 and S2, it is decided whether data has been recorded on the write-once optical disk 101. That is, it is checked whether information of an optimum recording power or the like relating to the write-once optical disk 101 on which data should be recorded is stored in the memory 114 in the apparatus. First, in step S1, the amplitude level Am and an optimum recording power P0 which are stored when the trial writing is previously performed are read out from the memory 114. In step S2, it is decided whether the amplitude level Am and the optimum recording power P0 are stored. When it is decided that data of the amplitude level Am and the optimum recording power P0 do not exist in the memory 114, the processing goes to step S6.

[0022] In step S6, the trial writing is performed once in the power calibration area 102 on the write-once optical disk 101. First, the optimum recording power setting unit 113 sets plural recording power levels of the laser diode 107. The D/A converting circuit 109 D/A-converts the set recording power levels respectively and then the laser driving circuit 108 converts the same into a driving current for driving the laser diode 107 mounted on the pickup 106. Then, the laser diode 107 performs the trial writing in the power calibration area 102 at the set plural different recording power levels.

[0023] After the trial writing, the power calibration area 102 is reproduced and asymmetry of reproduction signals (RF signals) thereof is detected, whereby an optimum recording power P1 is detected. That is, the pickup 106 reproduces the power calibration area 102 and the RF signal generating circuit 110 generates an RF signal. Then, the peak/bottom detecting circuit 111 detects a peak level and a bottom level of the RF signal. The A/D converting circuit 112 A/D-converts signals of the detected peak level and bottom level, and the optimum recording power setting unit 13 captures the converted signals. The optimum recording power setting unit 113 detects asymmetry of the RF signals from the peak Level and the bottom level, thereby setting the optimum recording power P1.

[0024] Then, in step S7, an area in the power calibration area 102 in which data is recorded with the optimum recording power P1 is reproduced and an amplitude level Aw of an RF signal of the area is detected. That is, the area in which the optimum recording power P1 is detected is reproduced by the pickup 106, and the amplitude level Aw is detected through the RF generating circuit 110, the peak/bottom detecting circuit 111, the A/D converting circuit 112, and the amplitude level calculating unit 115.

[0025] In step S8, the optimum recording power P1 detected in step S6 and the amplitude level Aw detected in step S7 are stored in the memory 114. Then, in step S9, recording is started in the data area 103 using the optimum recording power P1.

[0026] Hereinafter, an operation of calibrating an optimum recording power prior to the additional recording on the write-once optical disk 101 will be described. That is, the operation when it is decided in step S2 that the data of the amplitude level Am and the optimum recording power P0 exist in the memory 114 will be described. The additional recording is often performed after time elapses from the preceding recording. Therefore, there is a possibility that the optimum recording power changes due to changes with time in the pickup 106 or the like. In this embodiment, since the apparatus has a structure for calibrating the optimum recording power as described later, the apparatus can cope with the case where the optimum power value changes.

[0027] As described above, before the additional recording, the optimum recording power P0 at the preceding recording and the amplitude level Am of the RF signal corresponding thereto, which are stored in the memory 114 for each write-once

optical disks 101, are read out in step S1. Then, in step S2, it is decided whether the data of the amplitude level Am and the optimum recording power P0 are recorded. In case of the calibration operation, since the data of Am and P0 are already stored, it is decided "YES" and the processing goes to step S3.

[0028] In step S3, an area in the power calibration area 102 in which the optimum recording power P0 is detected is reproduced by the pickup 106, and the amplitude level Ar of the RF signal is detected through the RF generating circuit 110, the peak/bottom detecting circuit 111, the A/D converting circuit 112, and the amplitude level calculating unit 115.

[0029] In steps S4 and S5, the comparing unit 116 compares the amplitude level Am read out from the memory 114 with the amplitude level Ar detected in step S3. If there are influences of dust or dirt, or changes with time in the pickup 106, the amplitude level Ar naturally becomes smaller than the amplitude level Am. Therefore, if the additional recording is performed using the same optimum recording power P0 as that used at the preceding recording, an appropriate RF signal cannot be obtained.

[0030] Accordingly, in step S5, when the ratio Ar/Am of the amplitude level Ar detected at the additional recording to the amplitude level Am detected at the preceding recording is a prescribed threshold or below, it is decided that the optimum recording power should be renewed. Then, the processing of trial writing subsequent to step S6 is performed. A new optimum recording power is obtained and an amplitude is calculated, and the content stored in the memory 114 is renewed with a newly obtained optimum recording power and an amplitude level.

[0031] As a result of the comparison in step S5, when the difference between Am and Ar is quite small and the ratio Ar/Am is larger than the prescribed threshold, the processing goes to step S9 and the recording can be performed in the data area 103 using the optimum recording power P0. Therefore, there is no need of trial writing in this case and the consumption of the power calibration area 102 can be reduced. Here, the threshold can be previously set as a value which is decided taking in account of the recording and reproducing performance.

[0032] It should be noted that the optimum recording power setting unit 113, the amplitude level calculating unit 115, and the comparing unit 116, which are described in this embodiment are realized by a program by a microcomputer such as a CPU.

[0033] As described above, according to this embodiment of the present invention, the optimum recording power and the amplitude level which are obtained by performing the trial writing in the power calibration area are stored in the memory and it is decided whether the stored amplitude level changes when the additional recording is performed. At this time, when the amplitude level greatly changes due to the changes with time in the pickup or the influences of dirt or dust accumulated in the pickup and it is decided that there is a possibility that the recording quality is deteriorated if the recording is performed using the stored optimum recording power, the trial writing is performed again and a new optimum recording power is set. Therefore, even when there exist changes with time in the pickup of the optical disk recording apparatus, or particularly, dirt or dust are accumulated in the pickup, the optimum recording power can be set again, thereby preventing the recording quality from being deteriorated.

[0034] Further, the content stored in the memory is renewed with the newly obtained optimum recording power and the amplitude level, whereby the optimum recording power and the amplitude level can be used at the subsequent recording as a reference.

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Optical disc recording device

Claims of corresponding document: **US6339578**

What is claimed is:

[0036] 1. An optical disk recording apparatus comprising:an optimum recording power setting unit for obtaining an optimum recording power of a laser diode when data is recorded on an optical disk, by performing trial writing in a power calibration area on the optical disk; an amplitude level calculating unit for obtaining an amplitude level of a reproduction signal which is obtained by reproducing an area in the power calibration area in which the trial writing is performed with the obtained optimum recording power; a memory for storing the obtained optimum recording power and the amplitude level of the reproduction signal; and a comparing unit for comparing a difference between the amplitude level of the reproduction signal stored in the memory and an amplitude level of a reproduction signal which is obtained by reproducing again the area in which the trial writing is performed with the optimum recording power, to a prescribed value, when additional recording is performed on the optical disk; wherein the optimum recording power setting unit performs trial writing in the power calibration area and sets an optimum recording power to be used in the additional recording when the comparing unit decides that the difference exceeds the prescribed value, and sets the optimum recording power stored in the memory as an optimum recording power to be used in the additional recording when the comparing unit decides that the difference does not exceed the prescribed value.

[0037] 2. A method for setting an optimum recording power in an optical disk recording apparatus comprising the steps of:obtaining an optimum recording power of a laser diode when data is recorded on an optical disk, by performing trial writing in a power calibration area on the optical disk; obtaining an amplitude level of a reproduction signal which is obtained by reproducing an area in the power calibration area in which the trial writing is performed with the obtained optimum recording power; storing the obtained optimum recording power and the amplitude level in the memory; when additional recording is performed on the optical disk, comparing a difference between the amplitude level of the reproduction signal stored in the memory and an amplitude level of a reproduction signal which is obtained by reproducing again the area in which the trial writing is performed with the optimum recording power, to a prescribed value; performing trial writing in the power calibration area and setting an optimum recording power to be used in the additional recording when it is decided that the difference exceeds the prescribed value; and setting the optimum recording power stored in the memory as an optimum recording power to be used in the additional recording when it is decided that the difference does not exceed the prescribed value.

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[71]申请人 松下电器产业株式会社
地址 日本大阪府
[72]发明人 佐佐木昭典
楠濑尚

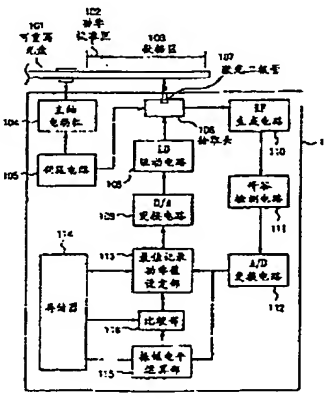
[74]专利代理机构 中国国际贸易促进委员会专利商标事务所
代理人 王以平

权利要求书1页 说明书6页 附图页数2页

[54]发明名称 光盘记录装置

[57]摘要

提供一种节约功率校准区的耗费同时适当地更新最佳记录功率值来防止记录质量降低的光盘记录装置和设定最佳记录功率值的方法。在本光盘记录装置中，存储在功率校准区中进行试写而得到的最佳记录功率值和重放RF信号的振幅电平Am，当向可重写光盘进行追加记录时，再次重放前次进行试写的区域而求出振幅电平Ar，把存储的振幅电平Am与Ar进行比较。如果振幅电平降低，则重新进行试写，而更新最佳记录功率值，如果振幅电平没有降低，则用所存储的最佳记录功率值进行追加记录。



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权 利 要 求 书

1. 一种光盘记录装置，其特征在于，包括：

最佳记录功率值设定部，通过在光盘上的功率校准区中进行试写而求出向光盘记录数据时的激光二极管的最佳记录功率值；

振幅电平运算部，求出在上述功率校准区中重放用上述求出的最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平；

存储器，存储上述求出的最佳记录功率值和振幅电平；

比较部，在向上述光盘进行追加记录时，把在上述存储器中所存储的振幅电平与再次重放用上述最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平之差同预定值进行比较；

在由上述比较部判断为上述差超过预定值时，上述最佳记录功率值设定部在上述功率校准区中进行试写，来设定在上述追加记录中使用的最佳记录功率值，当判断为未超过该预定值时，把在该存储器中所存储的最佳记录功率值设定为在该追加记录中使用的最佳记录功率值。

2. 一种光盘记录装置中的最佳记录功率值的设定方法，包括下列步骤：

在光盘上的功率校准区中进行试写而求出向光盘记录数据时的激光二极管的最佳记录功率值，

求出在上述功率校准区中重放用上述求出的最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平，

把上述求出的最佳记录功率值和振幅电平存储到存储器中；

在向上述光盘进行追加记录时，把在上述存储器中所存储的振幅电平与再次重放用上述最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平之差同预定值进行比较，

当判断为上述差超过预定值时，在上述功率校准区中进行试写，来设定在上述追加记录中使用的最佳记录功率值，

当判断为未超过该预定值时，把在该存储器中所存储的最佳记录功率值设定为在该追加记录中使用的最佳记录功率值。

说　　明　　书

光盘记录装置

本发明涉及一种光盘记录装置，特别是涉及，特征在于校正向光盘进行记录时的最佳记录功率值的结构的光盘记录装置。

在向可重写光盘等进行记录时，为了得到稳定的记录质量，在记录之前，在盘上的功率校准区中，用多个不同的记录功率值进行试写。接着，重放进行了试写的区域，检测重放RF信号的非对称性，由此，设定记录时的最佳记录功率值。

通常，由于准备了仅能进行100次试写的可重写光盘上的功率校准区，故需要节约校准区的耗费，在现有技术中，采用以下方法：

即，当进行一次试写时，若检测出最佳记录功率值，则把该最佳记录功率值与用于识别该盘的盘识别码一起存储在光盘记录装置内部的存储器中。在可重写光盘中，在盘的PMA（程序存储区）中保存记录过程中的盘的信息，而在其中能够记录用于识别各个盘的盘识别码。

在进行追加记录时，从PMA读出盘识别码，另一方面，从光盘记录装置内部的存储器读出与该盘识别码相对应的最佳记录功率值。使用所读出的最佳记录功率值进行追加记录。由此，即使在取出盘并再次插入之后和电源中断并再次接通之后，当进行追加记录时，能够不必再次进行试写而进行记录，因此，能够节约校准区的耗费。

例如，在日本专利申请公开公报特开平6-349066号公报中，揭示了一种记录用激光功率设定装置，能够求出适合于CD－R盘的记录用激光功率的最佳值。

但是，在从光盘装置内部的存储器读出与各盘相对应的最佳记录功率值来进行追加记录的上述现有构成中，存在以下问题：即，由于光盘记录装置的拾取头的时效变化，特别是在拾取头内部蓄积尘埃，最佳记录功率值发生变动，故原封不动地使用在存储器中所存储的最佳记录功率值来进行记录，就存在记录质量降低等问题。

因此，为了解决上述问题，本发明的目的是提供一种光盘记录装置，能够

在抑制功率校准区的耗费的同时，适应于拾取头的时效变化。

根据本发明的方法，上述目的这样实现：在向光盘的追加记录之前，检验在光盘装置内部的存储器中存储的各盘的记录功率最佳值是否没有变动，判断是否原封不动地使用所存储的记录功率值来进行追加记录也能获得所希望的记录质量，在使用所存储的记录功率值会产生某种问题的情况下，再次进行试写，再次设定最佳记录功率值。

本发明的技术方案1的发明是一种光盘记录装置，其特征在于，包括：最佳记录功率值设定部，在光盘上的功率校准区中进行试写而求出向光盘记录数据时的激光二极管的最佳记录功率值；振幅电平运算部，求出在上述功率校准区中重放用上述求出的最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平；存储器，存储上述求出的最佳记录功率值和振幅电平；比较部，在向上述光盘进行追加记录时，把在上述存储器中所存储的振幅电平与再次重放用上述最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平之差同预定值进行比较；在由上述比较部判断为上述差超过预定值时，上述最佳记录功率值设定部在上述功率校准区中进行试写，来设定在上述追加记录中使用的最佳记录功率值，当判断为未超过该预定值时，把在该存储器中所存储的最佳记录功率值设定为在该追加记录中使用的最佳记录功率值。

本发明的技术方案2的发明是一种光盘记录装置中的最佳记录功率值的设定方法，包括下列步骤：在光盘上的功率校准区中进行试写而求出向光盘记录数据时的激光二极管的最佳记录功率值，求出在上述功率校准区中重放用上述求出的最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平，把上述求出的最佳记录功率值和振幅电平存储到存储器中；在向上述光盘进行追加记录时，把在上述存储器中所存储的振幅电平与再次重放用上述最佳记录功率值所试写的区域而得到的重放RF信号的振幅电平之差同预定值进行比较，当判断为上述差超过预定值时，在上述功率校准区中进行试写，来设定在上述追加记录中使用的最佳记录功率值，当判断为未超过该预定值时，把在该存储器中所存储的最佳记录功率值设定为在该追加记录中使用的最佳记录功率值。

本发明的这些和其他的目的、优点及特征将通过结合附图对本发明的实施例的描述而得到进一步说明。在这些附图中：

图1是本发明的一个实施例中的光盘记录装置1的方框图；

图2是说明本发明的一个实施例中的光盘记录装置1所进行的最佳记录功率值的设定动作的流程图.

下面使用附图来说明本发明的一个实施例. 图1是本发明的一个实施例中的光盘记录装置1的方框图.

光盘记录装置1包括: 驱动可重写光盘101的主轴电动机104、控制主轴电动机104的旋转的伺服电路105、装载了向可重写光盘101的数据区103进行记录的激光二极管107的拾取头106、驱动激光二极管107的LD驱动电路108、得到用于驱动LD驱动电路108的驱动电流的D/A变换电路109、从拾取头106读取功率校准区102而得到的信号生成重放RF信号的RF生成电路110、检测重放RF信号的峰值电平和谷底电平的峰谷检测电路111、对峰值电平和谷底电平进行A/D变换的A/D变换电路112、设定激光二极管107的记录功率值的最佳记录功率值设定部113、存储最佳记录功率值和后述的振幅电平的存储器114、检测重放RF信号信号的振幅电平的振幅电平运算部115、把在进行追加记录时检测出的振幅电平Ar与在存储器114中所存储的振幅电平Am进行比较的比较部116.

最佳记录功率值设定部113向可重写光盘101上的功率校准区102中进行试写来求出当向可重写光盘101进行记录时从激光二极管107所发出的光的最佳记录功率值, 把所求出的功率值存储到存储器114中. 并且, 在进行追加记录时, 通过后述的动作, 当比较部116判断为振幅电平Ar与振幅电平Am之差超过预定值时, 最佳记录功率值设定部113在功率校准区102中进行试写, 进行在追加记录中使用的最佳记录功率值的设定, 当比较部116判断为振幅电平Ar与振幅电平Am之差未超过预定值时, 最佳记录功率值设定部113把在存储器114中所存储的最佳记录功率值设定为可重写光盘101的追加记录中的最佳记录功率值.

下面使用图2来对本实施例的光盘记录装置1的动作进行说明. 图2是说明光盘记录装置1所进行的最佳记录功率值的设定动作的流程图.

在向可重写光盘101的数据区103进行记录之前, 必须得到最佳记录功率值.

因此, 在S1、S2的步骤中, 判定是否向可重写光盘101进行了记录. 即, 分析在装置内部的存储器114中是否存储了关于将要进行记录的可重写光盘

101 的最佳记录功率值等信息. 首先, 在步骤 S1 中, 从存储器 114 读出在以前进行试写时存储的振幅电平 Am 和最佳记录功率 P0. 在步骤 S2 中, 判断是否存储了振幅电平 Am 和最佳记录功率 P0, 如果判断为在存储器 114 内不存在 Am 和 P0 数据, 移到步骤 S6.

在步骤 S6 中, 在可重写光盘 101 的功率校准区 102 中进行一次试写. 首先, 在最佳记录功率值设定部 113 中设定激光二极管 107 的记录功率强度, 由 D/A 变换电路 109 把所设定的记录功率电平进行 D/A 变换之后, 变换为由激光器驱动电路 108 驱动装在拾取头 106 上的激光二极管 107 的驱动电流. 接着, 由激光二极管 107 用所设定的多个不同的记录功率强度向功率校准区 102 进行试写.

在试写之后, 重放功率校准区 102, 通过检测出该重放 RF 信号的非对称性, 检测出最佳记录功率值 P1. 即, 由拾取头 106 重放功率校准区 102, 由 RF 生成电路 110 生成重放 RF 信号. 接着, 由峰谷检测电路 111 检测出该重放 RF 信号的峰值电平和谷底电平, 由 A/D 变换电路 112 对所检测出的峰值电平和谷底电平的信号进行 A/D 变换, 把 A/D 变换后的信号取入最佳记录功率值设定部 113. 在最佳记录功率值设定部 113 中, 通过从峰值电平和谷底电平检测出重放 RF 信号的非对称性, 来设定最佳记录功率值 P1.

接着, 在步骤 S7 中, 重放功率校准区 102 中以最佳记录功率值 P1 所记录的区域, 检测出该重放 RF 信号的振幅电平 Aw. 即, 由拾取头 106 重放检测出最佳记录功率值 P1 的区域, 由 RF 生成电路 110、峰谷检测电路 111、A/D 变换电路 112 以及振幅电平运算部 115 的路径, 检测出振幅电平 Aw.

在步骤 S8 中, 把在步骤 S6 中检测出的最佳记录功率值 P1 和在步骤 S7 中检测出的振幅电平 Aw 存储到存储器 114 中. 接着, 在步骤 S9 中, 使用最佳记录功率值 P1 开始向数据区 103 进行记录.

下面对在向可重写光盘 101 的追加记录之前进行的最佳记录功率值的校正动作进行说明. 即, 对在步骤 S2 中判断为在存储器 114 内存在 Am 和 P0 数据的情况下的动作进行说明. 一般来说, 追加记录是在前次记录之后经过一段时间以后进行的. 因此, 随着拾取头 106 的时效变化等, 存在最佳功率值发生变动的可能性. 在本实施例中, 如后述那样, 包括校正最佳记录功率值的结构, 因此, 在最佳功率值发生变动的情况下能够处理.

如上述那样，在进行追加记录之前，在步骤S1中，读出对每个可重写光盘101在存储器114中存储的前次记录时的最佳记录功率P0和与其相对应的重放RF信号的振幅电平Am，在步骤S2中，判断是否存储了Am和P0数据．在校正动作时，由于Am和P0数据已经存储了，故判断为YES，进到步骤S3．

在步骤S3中，由拾取头106重放功率校准区102中检测出最佳记录功率P0的区域．经过RF生成电路110、峰谷检测电路111、A/D变换电路112、以及振幅电平运算部115的路径检测出重放RF信号的振幅电平Ar．

在步骤S4和S5中，由比较部116把从存储器114所读出的振幅电平Am与在步骤S3中检测出的振幅电平Ar进行比较．如果在拾取头106上存在尘埃等的影响和时效变化，当然振幅电平Ar要小于Am．因此，使用与前次相同的最佳记录功率P0就不能得到适当的重放RF信号．

因此，在步骤S5中，如果在追加记录时检测出的振幅电平Ar与前次的振幅电平Am之比Ar/Am为预定的阈值以下，就需要更新最佳记录功率值，而移到步骤S6以后的试写处理中．接着，求出新的最佳记录功率值，同时，运算振幅电平，把存储器114的存储内容更新为新得到的最佳记录功率值和振幅电平．

如果步骤S5中的比较的结果是几乎没有见到Am和Ar的差，两者之比Ar/Am大于预定的阈值，则进到步骤S9，原封不动地使用最佳记录功率P0来进行记录是没有问题的．此时，由于已经进行了试写，就能节约功率校准区102的耗费．可以用考虑了记录重放特性的值来预先设定阈值．

不言而喻，在本实施例中说明的最佳记录功率值设定部113、振幅电平运算部115和比较部116可以由CPU这样的微型计算机中的程序来实现．

如上述那样，根据本发明的实施例，把在功率校准区中进行试写而求出的记录功率最佳值和振幅电平存储到存储器中，当进行追加记录时，判断存储的振幅电平是否有变动．此时，由于拾取头的时效变化和在拾取头内部所积蓄的尘埃等的影响，振幅电平会发生较大的变化，如果仍原封不动地使用所存储的最佳记录功率值来进行记录就会出现记录质量降低的问题，当判断为发生该问题的情况下，再次进行试写，来设定新的最佳记录功率值．这样，即使存在光盘记录装置的拾取头的时效变化，特别是在拾取头内部积蓄了尘埃等，也能立刻进行最佳记录功率值的设定，因此，能够防止记录质量的降低．

而且，通过把存储器的存储内容更新为新得到的最佳记录功率值和振幅电平，就能成为以后进行记录时的基准。

另一方面，在振幅电平没有变动的情况下，原封不动地使用在存储器中所存储的最佳记录功率值来记录数据，因此，能够节约功率校准区的耗费。

说 明 书 附 图

图 1

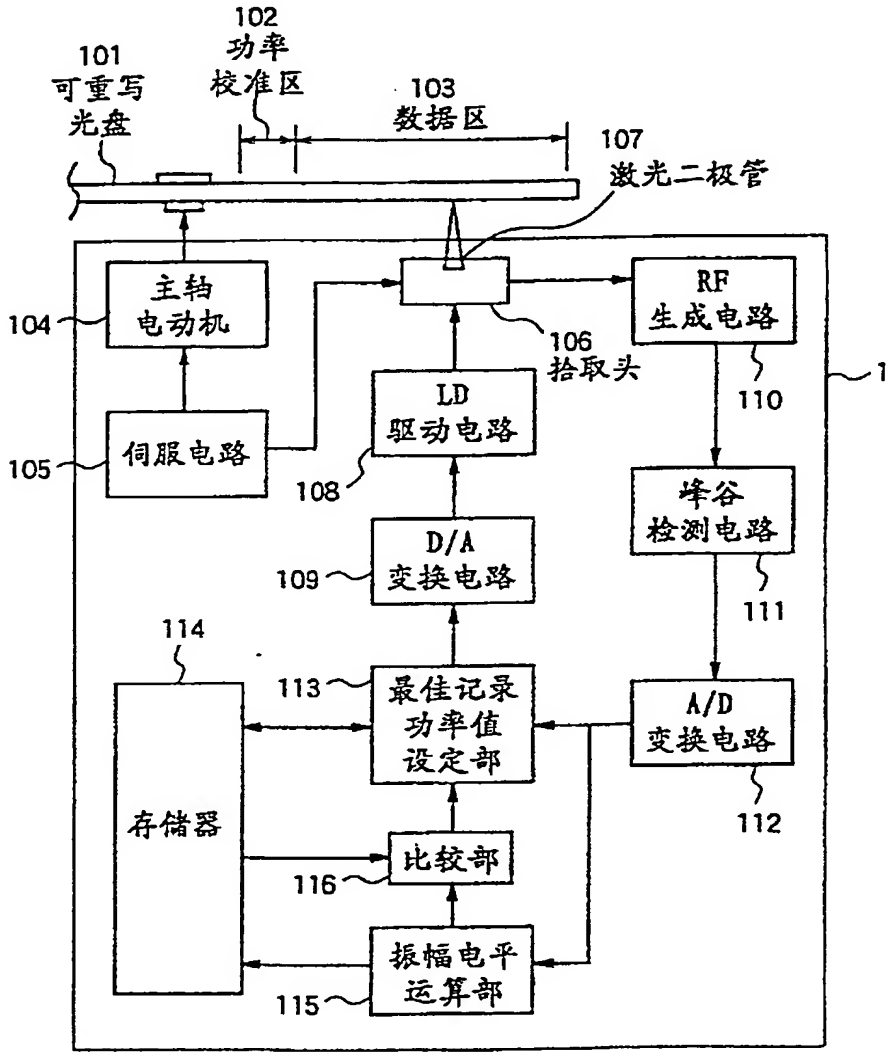
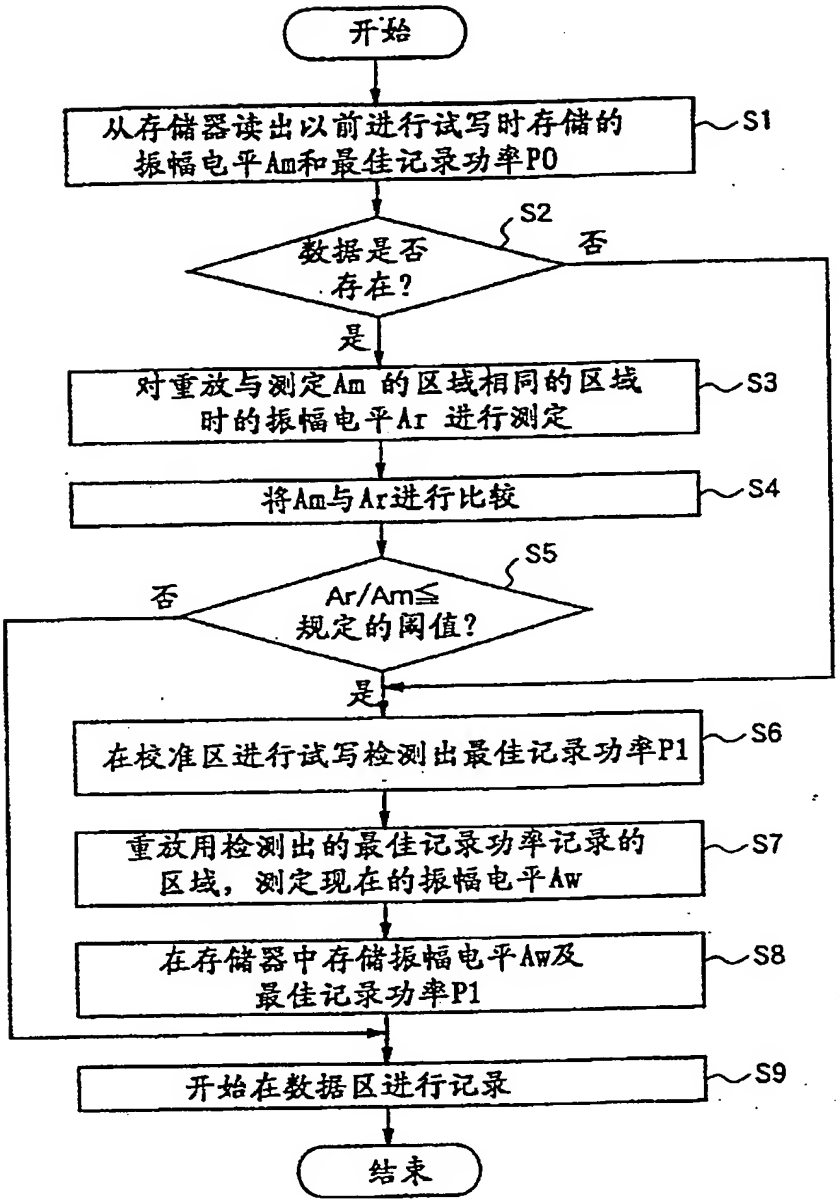

101
可重写
光盘
102
功率
校准区
103
数据区
107
激光二极管
主轴
电动机
104
伺服电路
105
LD
驱动电路
108
106
拾取头
RF
生成电路
110
1
峰谷
检测电路
111
D/A
变换电路
109
114
存储器
113
最佳记录
功率值
设定部
A/D
变换电路
112
比较部
116
振幅电平
运算部
115

图 2


开始
从存储器读出以前进行试写时存储的振幅电平Am和最佳记录功率P0
S1
数据是否存在?
S2
否
是
对重放与测定Am 的区域相同的区域时的振幅电平Ar 进行测定
S3
将Am与Ar进行比较
S4
Ar/Am≦规定的阈值?
S5
否
是
在校准区进行试写检测出最佳记录功率P1
S6
重放用检测出的最佳记录功率记录的区域，测定现在的振幅电平Aw
S7
在存储器中存储振幅电平Aw及最佳记录功率P1
S8
开始在数据区进行记录
S9
结束